Use of ICT in Higher Education, University Teacher Prospective an Analysis of Categorical Data

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ABSTRACT

This primary study uses of ICT in higher education, university teacher prospective analysis of categorical data using r programming tries to explore the satisfaction of ICT uses in higher education of university teacher on Prithvi Narayan campus Pokhara. The primary data were collected from February to March 2020. Although there was a large research gap in many researchers to analyze accurately if the variable is in categorical type. This research tries to meet the gap between the selection of appropriate tools for a categorical questionnaire survey of 32 university teachers. The satisfaction of teachers' concepts regarding the use of ICT to enhance student educational quality had expressed on different Likert scale could be summarized with the count, 93 percent of university teacher was satisfied for ICT use in classroom teaching. The chi-square value p equal to 0.08 signifies there was not rejection evidence of avoiding the null hypothesis. The different bar plots with a colorful image and their percentage and count could easily plot using r programming.

Keywords: Information and Communication Technology, Nepal Telecom, Higher Education.

1. INTRODUCTION

Information and communication technology (ICT) have significant changed on educational system in recent decades. Life without education is becoming difficult in modern society. Human resources management depends on the quality of education not only respondents but also trainer. Higher study provides education in colleges and universities which is academically appropriate to meet present national demand with two-step characteristics for clarity and user friendly. Higher education is considered as different from lower to higher education institutions. The rapid worldwide acceptance of computers with the Internet improves new ways of thinking about what we teach, how we teach and how we justify our pedagogical choices, to a large extent differs in the variety of subjects and their content. The computer is an electronic device that meets the demand for versatile applications in modern society. The exchange of data information from small files to too large database queries can be easily managed and processed with various databases. Likewise, the large network covers nearly 77 percent of the world's population using new mobile devices and their applications, whose growth rate has increased by nearly 300 percent in three years in the last decade, which is three times faster. of the industrial revolution [1]. The national report shows mobile phone users is expected to reach 5.1 billion [2]. Nepal Telecom's monthly report shows 1.86 percent increase in Nepal's phone users. Compared to the November 2018 figure, phone users have gone from 84% to 85.86%. The increase is due to a 1.6 percent increase in mobile users and a 0.01 percent increase in landline users [3]. Likewise, the UNDP report shows that only 6 percent of the total population is enrolled in higher education in Nepal, which is the world's 150th place in the world [4]. Similarly, 1.6 billion active users of social networks use the internet technological resources for creating, store and manage information which includes computers, the internet, transmission technologies [5]. The report on improving their financial education says that the government of Nepal establishes a strategy to implement the "information highway" to be established in the next decade. However, several factors are inhibiting it. One is that there is only one Internet service provider in the country, Nepal Telecom (NTC). Another constant supply of electricity cannot be guaranteed and outages across the country are common. Poor connectivity and a lack of technical skills make it difficult for people outside the country to connect with individuals and organizations within Nepal [4].

[6]conducted a study using structured questionnaire to faculty members of Kuwait University revealed the positive impact on teaching, research, and publication and cooperate with their colleagues. [7]explored the faculty members of Angelo State University. Similarly, [8]examined the gender differences usage among faculty members using qualities and quantities analysis. [9] report ICT in education uses has largely positive association. Therefore, in many countries the community service centers have been promote e-learning [10]. The results indicated that the faculty members of the university campus had good knowledge and skill in applying ICT [11].

The higher education in developed country has considered as primary a capital investment of national economic. The research and innovation with have primary responsibility for providing the advanced knowledge for national development [12]. Therefore, quality higher education is only source for the country's socio-economic changes. The students and teachers has to address the emerging challenges of the 21st century for the positive impact on the future development [13]. Therefore, this study tries to explore the use of ICT in higher education a university teacher prospective should analyzed for betterment of education system of developing country. Because many researchers collect various type of observations records, whose analysis tools were different according to their variable types. This research tries to analyze effectively on categorical data of university teacher prospective for the use of ICT in higher education in Prithvi Narayan campus Nepal.

2. INTERPRETATION OF DATA

As we know, the data are substantially in two categories, one is quantity and the other are qualities that describe the characteristics of each observational records. The categorical data are those that describe the records on various qualities such as the Likert scale in qualities. These types of data could be analyzed using various programming tools. The researcher developed the pre-test questionnaire in the google form survey during February to March 2020 and collected the records of 32 university professors at Prithvi Narayan campus and analyzed them using r programming. The records of each respondent in excel database loaded into r console using read.csv command with the configuration header equal to true. So that header of table will be available in r console.

> sn = read.csv ("C: / Users / user / Desktop / publishing / sak PNC Conference / ICT / STUDENT QUESTIONNAIREe.csv", header = T)

> names (sn)

[1] "Genre"

.....

[14] "ICT.is.use.for.download.upload.teaching.materials.from.you.college. website"

The naming command displays the header of the database table name. As we know, the registers first collect the qualitative data of university professors whose data must be analyzed based on the categorical average of the statistics. The table can be easily developed and stored in the variable.

> t = table (sn \$ IsICT significant)

> prop.table (t)

I strongly agree strongly strongly disagree

0.34375 0.59375 0.06250

The first response from university teachers is that "ICT is important for higher education in the university study" response data will be generated using the proportional table of categorical data. 59 percent of university professors found fully agree and 34 percent of the faculty agree with the most significant in higher education whereas there was .05 (6) percent teacher single teacher was disagreeing with the application of ICT in higher education.

> tab=table(sn\$IsICTsignificant,sn\$ICTraiseEDUstd)

> tab

	Agree	Disagree	Strong	ly agree Strongly disagr	ee
Agree	8	1	2	0	
Strongly agree	10	0	8	1	
Strongly disagr	ee 1	0	0	1	

The multiple categorical data "is significant use of ICT" and "is ICT raise education standard" could be analyzed using table command in r console. The above table describes the significance of ICT in higher

education, ultimately raise the education standard of higher level teaching were strongly agreed (18) and 10 faculties were agreeing both have positive bust up in higher education whereas two teachers were strongly disagreeing and single faculty has disagreed with the role of ICT in modern teaching-learning in the campus.

- > library(gmodels)
- > CrossTable(sn\$IsICTsignificant,sn\$ICTraiseEDUstd)

The command cross table calculates chi-square of both categorical variables produces a table as below describes two ways columnar and row wise total of both data of 32 respondents with their percentage of each line total.

sn\$IsICTsignificant	Agree	Disagree	Strongly agree	Strongly disagree	Row Total	
Agree	8 0.330	1 1.253	2 0.601	0.688	11	į
	0.727 0.421 0.250	0.091 1.000 0.031	0.182 0.200 0.062	0.000 0.000 0.000	0.344 	
Strongly agree	10 0.146	0 0.594	 8 0.716	 1 0.030	 19 	
	0.526 0.526 0.312	0.000 0.000 0.000	0.421 0.800 0.250	0.053 0.500 0.031	0.594 	
Strongly disagree	1 0.030	0.062	 0 0.625		 2	
	0.500 0.053 0.031	0.000 0.000 0.000	0.000 0.000 0.000	0.500 0.500 0.031	0.062 	
Column Total	19 0.594	1 0.031	10 0.312	2 0.062	32	ĺ
						1

Cross-Tab output

The two way table data could available single using 1 for row data and 2 for column data using margin.table command as below.

> margin.table(tab,1) #row

Agree Strongly agree Strongly disagree

11 19 2

> margin.table(tab,2) #column

Agree Disagree Strongly agree Strongly disagree 19 1 10 2

> round(prop.table(tab),2)

	Agree	Disagree	Strongly A	S. disagre	e
Agree	0.25	0.03	0.06	0.00	
Strongly agree	0.31	0.00	0.25	0.03	
Strongly disagre	ee 0.03	0.00	0.00	0.03	

> round(prop.table(tab,1),2)

	Agree	Disagree	Str.A	S. disagree
Agree	0.73	0.09	0.18	0.00
Strongly agree	0.53	0.00	0.42	0.05
Strongly disagree	0.50	0.00	0.00	0.50

The total percentage of each categorical variable could easily calculated using round (prop. table) command of each items percentage in specified categories.

> chisq.test(tab)

The Pearson's chi-squared test produces the output x-squared is 11.199, df is 6, and p-value is 0.08241. This statistics test could only be applied when both data are in categorical values could easily test. The p-value 0.08 is greater than 0.05 percent confidence level indicates that there is not the enough evidence of rejection of null hypothesis that the faculty satisfaction between ICT use and raise in educational quality in higher education to the whole population has not to reject the null hypothesis.

- > fre=table(sn\$IsICTsignificant)
- > barplot (fre [order (fre, decreasing = T)])

> barplot(fre[order(fre)], horiz = T)

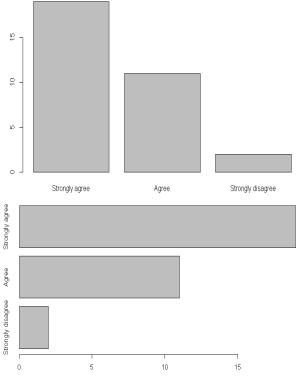
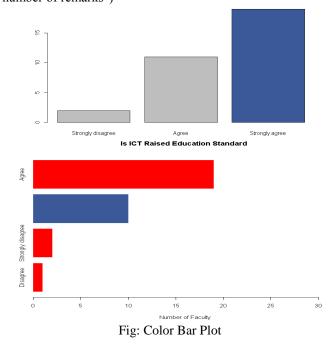


Fig: Vertical and Horizontal Bar plot

The tabular records of "is ICT has significant impact of higher education" will be plot with bar diagram with three categorical data. The first plot is in default with re-ordered in decreasing whereas the second plot on horizontal could plot when using horizon is equal to true summarized the categorical data with their respective frequencies.

- > scol=c(rep("gray",2), rgb (59,89,152, maxColorValue = 255))
- > barplot(fre[order(fre)], horiz = T, col = scol)
- > barplot(fre[order(fre)], horiz = T, col = scol, border = NA, xlim = c (0,32), main="School perfprmance", xlab="number of remarks")



The colorful bar plot attraction could be easily designed in scol variable with rgb color combination with highest color of 255. The first bar plot designed with two gray color then rgb to the third category.

Similarly, if the researcher wishes to plot beautiful graph red color display in horizontal bar plot in second figure with default boarder black with own title when color is red. Similarly, the bar graph could easily design using ggplot function as below too.

- > ggplot (sn, aes(x=IsICTsignificant)) +geom_bar ()
- > num=sn %>%
- + count (IsICT significant)
- > ggplot (num, aes (x = reorder (IsICTsignificant, n), y = n)) + $geom_bar$ (stat = "identity", fill = "blue", color = "black") + $geom_text$ (aes (label = n), vjust = -0.25) + labs (x = "Number", y = "count", title = "Satisfaction")

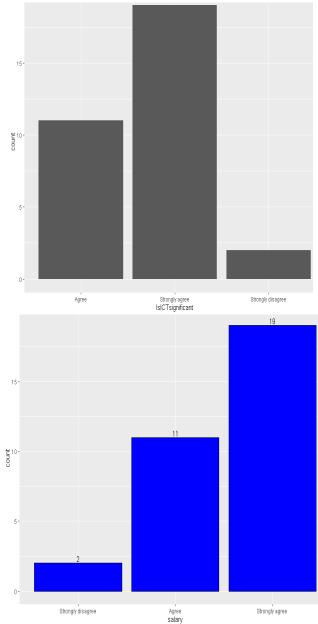


Fig: Normal and colorful bar plots of categorical variable

The first bar graph describes with the "is significant of ICT in higher educated" using ggplot command. Similarly, the second bar plot designed using ggplot command with color equal blue with design total count in vertical bar. The vjust value could be designed using according to user choices to be closer to bar border using -ve value for outside or positive value indicates inside bar.

- > per=sn %>%
- + count(IsICT significant) %>%
- + mutate (per = n / sum (n), + per_label = paste0 (round (per * 100), " % "))

> ggplot (per, aes (x=reorder (IsICTsignificant, -per), y=per)) + geom_bar (stat = "identity", fill="green", color="black") + geom_text (aes (label = per_label), vjust = 3.25)

- > labs (x = "id ICT Satisfaction", y = "Count", title = "Faculty satisfaction")
- > scale_y_continuous (labels = scales: percent) + theme_bw ()
- > library(lattice)
- > sn\$Year=as.character(sn\$Year)
- > barchart (data=sn, IsICTsignificant ~Year, groups=Gender, horizontal=FALSE)

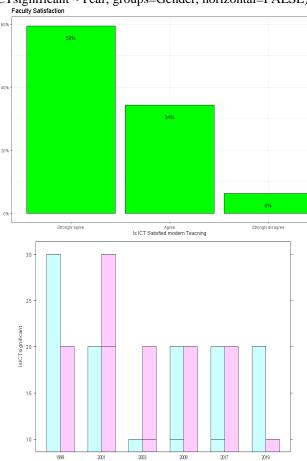


Fig: Bar plot percentage and Three categorical variable bar plot

The percentage could easily be calculated using count on ggplot and pasted with inside bar vjust making positive number of first color bar diagram. The x-axis and y-axis defines using the x-axis and y-axis command with green color filled with a black border surrounded on the bar. The year time series data, on three multiple categorical plots describes the three levels of satisfaction with group by gender male and female compares year wise. In 1999 6 female teacher and 4 male teacher were agreeing with ICT use in modern teaching has significant. This argument was reversed when comparing 2001 enrollment teacher perspective. The similar trends continue up to 2019 faculty enrollments..

3. CONCLUSION

The research conducted on ICT used and its implication on higher education was conducted in University teachers at Prithvi Narayan campus whose categorical data were analyzed with an explanation of each step using r programming. This study easily explores cross-tabulation of two-way categorical table calculates 93 percent of the university were agreed to use of ICT in higher study. The chi-square p-value 0.08 indicates there is no significant evidence to reject the null hypothesis of university faculty satisfaction and ICT has significant increase teaching-learning process of higher education. The bar plot of different categorical variables could be easily design using different colors and position rotation. The percentage and its same category count will easily have calculated and plotted within the plot. The time-series data like enrollment data of student with two more categorical variable bar diagram could be easily

plotted with colorful picture has significant plots of data interoperation could have developed with its number.

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